

Mont Pelée and After-Glow.

MAY I point out that the after-glow following the eruption of Krakatoa was—as I wrote at the time—remarkably emphasised on the west coast of British India.

Following the letter of Dr. W. J. S. Lockyer in NATURE of May 15, the after-glow, now, after the eruption of Mont Pelée (and Soufrière?) should be as remarkably emphasised in central and perhaps the southern part of North America.

In Europe this eruption will not (?) cause the same effect as to after-glow as the former. F. C. CONSTABLE.

Wick Court, near Bristol, May 18.

THE VOLCANIC ERUPTIONS IN THE WEST INDIES.

SINCE we went to press last week further details have become available as to the volcanic disaster in the West Indies. We give a summary of the reports which have been published in the *Times* during the past week upon the sequence and character of the eruptions from the commencement of the disturbances, the particulars here given being supplementary to those in our last issue.

April.—In the last days of April smoke was noticed on Mont Pelée and rumbling sounds were heard.

May 3.—Mont Pelée threw out dense masses of steam. Next morning the sky was dark with clouds and ashes. Ashes fell on St. Pierre, which by evening was covered a quarter of an inch thick. The mountain was invisible.

May 4.—A sea-breeze swept the ashy fog from St. Pierre, but at evening dust and scoria fell again.

May 5.—A stream of lava 20 feet high suddenly rushed down the south-western slope of Mont Pelée, and, following the dry bed of the River Blanche, swept away buildings, plantations and people in a tremendous rush to the sea, five miles distant. It was all over in three minutes. The Guérin factory on the beach near the mouth of the river was embedded in lava; only the chimney could be seen. The sea then receded along the western coast a distance of 100 yards, and returning invaded St. Pierre.

May 5, St. Vincent.—The lake in the old crater of the Soufrière became greatly disturbed.

May 6, St. Vincent.—At 2 o'clock in the afternoon the Soufrière began a series of volcanic efforts. Severe earthquakes accompanied these. Terrible noises and detonations succeeded quickly, and at 7 p.m. an immense column of steam issued from the crater, continuing until midnight.

May 7, St. Vincent.—Terrific explosions occurred, and at 7 a.m. there was another sudden violent escape of steam. This ascended for three hours, when a quantity of material matter was ejected. At noon three craters appeared to open and began to vomit lava. Tremendous detonations followed in quick succession, rapidly merging into a continuous roar. The thundering was heard throughout the Caribbean Sea.

A huge cloud in dark dense columns charged with volcanic matter rose to a height of eight miles from the mountain top, and darkness like midnight descended. The sulphurous air was laden with fine dust, and black rain followed the rain of scorix, rocks and stones.

May 8, Fort de France.—St. Pierre was within ten minutes annihilated by a terrible volcanic torrent from Mont Pelée and by a combination of suffocating heat, noxious vapours, a shower of burning cinders, and a discharge of burning stones, which reached even to Fort de France.

May 13, St. Vincent.—The Soufrière is still in eruption. The reports of the explosions, resembling a terrific cannonade, can be heard at a distance of 100 miles. Following the explosions are columns of steam, which rise miles in height, and immense luminous bombs also issue from the crater. Lightning is playing fiercely in the upper sky.

May 15, Fort de France.—Mont Pelée continues in a state of eruption, but the wind is now carrying the smoke and the greater part of the matter thrown out to the north, thus relieving the parties of workers at St. Pierre.

May 15, Kingston, Jamaica.—For some days past the atmosphere here has been peculiarly hazy and sombre and the temperature very high, which was thought to be due to dust brought by winds from the volcanoes. This is now proved to be the case, dust

being detected falling on the hills, which on microscopic examination is shown to be volcanic ash.

May 15, St. Vincent.—The entire northern part of the island is covered with ashes averaging 18 inches in depth, and varying from a thin layer at Kingstown to 24 inches or more at Georgetown. The streets of Georgetown are encumbered with heaps of ashes like snow-drifts, and several roofs have fallen in from the weight of the deposits upon them.

May 15, Fort de France.—At intervals Mont Pelée and Lacroix, 1350 metres high, are visible. Now that all the points of eruption can be discerned, seven craters can be seen which seem still active. Yesterday a flow of lava 400 metres wide descended as far as White River, its foaming sound being audible to a great distance. A new crater is perceptible near the shore, pouring out blinding steam. The sea, affected by the disturbances of all the streams, seems itself troubled, invades Prêcheur, and, undermining several houses, adds the ravages of inundation to those of fire. On the other hand, the flow of lava drives back the bay 20 metres and increases the area of devastation.

May 17, St. Vincent.—The bed of the lava in the windward district is still hot. An abyss 500 feet deep by 200 feet wide, which existed between Langly Park and Rabacci, is filled with lava, and the physical features of the mountain side are apparently more beautiful than before the eruption. A curious feature is that the earthquakes were not general. While at Château Belair there were, before the eruption, continuous convulsions every few hours, in Kingstown and Georgetown there were only sixty shocks in four hours.

Although it resulted in fewer fatalities, the eruption of the Soufrière was no less violent than that of Mont Pelée. Sixteen square miles are covered with lava.

May 19, St. Thomas.—A further serious eruption of Mont Pelée occurred. The search parties at St. Pierre were compelled to leave at once.

May 20, St. Thomas.—Very loud detonations were heard in Dominica, Guadeloupe, Antigua and St. Kitts, and faintly in St. Thomas. At St. Thomas the sounds heard were louder than those of May 7.

There is great reason to hope that a small scientific party from England will be promptly despatched to investigate the terrible volcanic outbursts in the West Indies. The idea was mooted in conversation in the ante-room of the Royal Society at last week's meeting, and Dr. Tempest Anderson, who probably has examined and photographed volcanic phenomena in more regions than any other Englishman, at once expressed his readiness to undertake the journey. Strong hope is entertained that leave of absence may be granted to Dr. Flett, petrologist to the Geological Survey, to join in the investigation, the expenses of which might be defrayed, notwithstanding some technical difficulties, from the Government Grant. It is to be hoped these may be overcome, because no time should be lost, and the party should start by the next boat on May 28. They will naturally go first to St. Vincent and endeavour to obtain trustworthy accounts of the eruption of the Soufrière, to ascertain the changes which have been made in the physical geography of the district, and to collect specimens of the materials ejected, as far as possible in chronological order. But we may hope that they will not restrict themselves to the British Island. The eruption at Mont Pelée in Martinique has been, not only more destructive to life, but also, according to what has been published, more abnormal in its phenomena. So contradictory are the reports that it is at present almost impossible to say what really has happened, beyond the one melancholy fact that a paroxysm in an eruption of unusual violence has caused unwonted devastation and fearful loss of life. By examination on the spot, by conference with other scientific investigators, who may already have reached the island from America or France, rumours may be sifted and evidence obtained from examination of the materials beneath which St. Pierre has been buried. A good collection of them, and other ejectamenta of the volcano, will be of great value. A comparison of those from the two islands may throw light on some interesting

and important questions. The fact that the eruptions have been almost simultaneous suggests that the orifices are situated on the same fissure, but it is, of course, possible that they may indicate a zone rather than a line of weakness in the earth's crust, and so may not have tapped precisely the same source of supply. Again, both eruptions have been preceded by a long pause, during which a column of heated material may have been kept standing for several years in the "neck" of the volcanoes. If so that would be very favourable to magmatic differentiation, and this might be revealed on chemical and microscopic examination of the materials discharged during the successive stages of the eruptions. Dr. Tempest Anderson's wide experience as a traveller, especially in volcanic districts, with his skill as a photographer, and Dr. Flett's intimate knowledge of all sides of petrology, will ensure, by their working in combination, that nothing will be missed, and important accessions be made to our knowledge of vulcanology. The shortness of the time before starting is the main difficulty, but as the enterprise is said to be favourably regarded by the Colonial Office and the officers of the Royal Society, and is heartily backed by several London geologists, technical difficulties should not prove insuperable.

There are various signs that the eruptions in the West Indies are connected with the occurrence of other terrestrial and cosmic phenomena. A report in the *Daily Mail* states that the mineral spring waters at Teplitz, Bohemia, turned brown suddenly last week. A similar phenomenon was observed before the great earthquake at Lisbon in 1755, and a repetition of the disaster is feared.

Telegraphic communication between Karachi and the rest of India has been interrupted for four days by the occurrence of the most severe and destructive storm ever known in Sind. Upwards of 40 miles of the Sind Railway have been washed away, bridges and embankments have disappeared, and the telegraph line for 50 miles either completely vanished or hopelessly dismantled.

There has been a great storm in the United States. A telegram from Goliad, Texas, states that on May 18, at 3.45 p.m., a tornado, preceded by heavy hail, swept over the town and caused great destruction. The storm lasted only five minutes. It came from the south-east without warning, and travelled as far as Kentucky, traversing four States.

Also from the United States news has been received of a great mining disaster. On May 19, at 7.30 a.m., the Fraterville and Thistle coal mines at Coal Creek, Tennessee, exploded, causing the death of about three hundred men at work in them. Rescue parties have been unable to penetrate far into the mines on account of stifling smoke and gas and extreme heat.

Mr. W. Eddy, of New York, reports that on May 15 a slight earth tremor affected three of his seismographs, the wave coming from the south-east.

All these disturbances are possibly related to a common cause, as suggested by Sir Norman Lockyer in the following letter, which appeared in Monday's *Times* :—

THE WEST INDIAN ERUPTIONS AND SOLAR ENERGY.

Sir,—In 1883, in connection with the eruption of Krakatoa, you were good enough to allow me to appeal through your quickly and widely circulated columns for early information to enable me to test an idea connected with the spread of the glorious sunsets round the world which followed the event.

Because the terrible catastrophes in Martinique and St. Vincent occurred at a well-defined sun-spot *minimum* I was led to inquire whether similar coincidences were to be traced in the past. I did not know then, but I know now, that Wolf, exactly half a century ago, had suggested a connection between solar and seismic activity; in his time, however, the record of solar changes was short and imperfect.

In my own inquiry I have used our most recently compiled tables, which are now complete for the last seventy years, and I have only considered seismic disturbances within that period. I

find it beyond question that the most disastrous volcanic eruptions and earthquakes generally occur, like the rain pulses in India, round the dates of the sun-spot *maximum* and *minimum*. More than this, the 35-year solar period established by Dr. Lockyer, which corresponds approximately with Bruckner's meteorological cycle, can also be obviously traced, so that, indeed, the intensification of the phenomena at the *minimum* of 1867 is now being repeated.

In 1867, Mauna Loa, South America, Formosa, Vesuvius were among the regions involved; in the West Indies it was the turn of St. Thomas. The many announcements of earthquakes in the present year before the catastrophe of St. Pierre will be in the recollection of everybody.

In the *maximum* in 1871-72, to name only West Indian stations, Martinique first and then St. Vincent followed suit; in the next *maximum*, in 1883, came Krakatoa.

At Tokio, in a country where the most perfect seismological observatories exist, we find that at times near both sun-spot *maxima* and *minima* the greatest number of disturbances have been recorded.

Very fortunately, the magnificent work of the Indian Meteorological Department enables us to associate the solar changes with pressures in the tropics, and obviously these pressures have to be taken into account and carefully studied.

This, Sir, brings me to the point of this letter, which is, through your kindness, to ask from meteorological observers in the West Indies and the surrounding regions the favour of copies of their barometrical readings, showing the departures from the local means for the two months preceding the eruption at St. Pierre. In this way one or two years may be saved in getting at the facts.

I am, Sir, your obedient servant,

NORMAN LOCKYER.

Solar Physics Observatory, May 17.

MOUNTAIN MASSES AND LATITUDE DETERMINATIONS.¹

WHEN we take a comprehensive view of the information that has been collected in order to determine the mean figure of the earth, we must acknowledge the important part that has been played by a long succession of Indian geodesists. For practically a century, with greater or less vigour, according to the political conditions prevailing at the time, continuous measurements have been carried on, with the result that we have at least eight meridional and four longitudinal arcs available for the general discussion. The differences of latitude extend from roughly 9° to 20° north, and include the determination of the astronomical latitude of some 150 stations, while the amplitude of the longitudinal arcs embraces nearly 25°, necessitating the investigation of fifty differences of longitude. The vigour displayed is the more curious since it must have been anticipated that the results would be affected with systematic error, as the deflection of the plumb-line would be materially influenced by local circumstances. Not only are the evident masses of the Himalayan range and the Tibetan plateau exercising an effect, which may, perhaps, be allowed for satisfactorily on the assumption of a uniform distribution of density in the strata below the surface, but the presence of the Indian Ocean on two sides of the peninsula, with its varying and uncertain depths, emphasises the difficulties of adjustment and compensation.

Since, however, in order to obtain the full value of the admirable work that has been accomplished in India, it is necessary to eliminate the effect of local attraction, various attempts have been made by different authorities, with, it must be admitted, only partial success. It is a matter of ancient, but of interesting, history to recall the suggestions and the controversy between Archdeacon Pratt and the late Astronomer Royal, the views of neither authority now being acceptable in their entirety, though

¹ "The Attractions of the Himalaya Mountains upon the Plumb-line in India. Considerations of recent Data." By Major S. G. Burrard, Royal Engineers, Superintendent Trigonometrical Surveys. Pp. vii + 115. (Dehra Dun, 1901).